

## SCHEDA DI SICUREZZA

# PBXN-5, PBXN-5/grafite

La scheda di sicurezza è in linea con Regolamento (UE) 2015/830 della Commissione, del 28 maggio 2015, recante modifica del regolamento (CE) n. 1907/2006 del Parlamento europeo e del Consiglio concernente la registrazione, la valutazione, l'autorizzazione e la restrizione delle sostanze chimiche (REACH)

### SEZIONE 1: Identificazione della sostanza o della miscela e della società/impresa

Data di compilazione	09.05.2018
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#### 1.1. Identificatore del prodotto

Nome del prodotto	PBXN-5, PBXN-5/grafite
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#### 1.2. Usi pertinenti identificati della sostanza o miscela e usi sconsigliati

Usi relativi identificati	PC11 Esplosivi
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#### 1.3. Informazioni sul fornitore della scheda di dati di sicurezza

##### Produttore

Nome della ditta	Chemring Nobel AS
Indirizzo postale	Engeneveien 7
Codice postale	N-3475
Nome del luogo	SÆTRE
Paese	Norvegia
Telefono	+47 32 27 86 00
E-mail	<a href="mailto:sales@chemringnobel.no">sales@chemringnobel.no</a>
Sito Internet	<a href="http://www.chemringnobel.no/">http://www.chemringnobel.no/</a>
Nome della persona di contatto	Richard Gjersøe

#### 1.4. Numero telefonico di emergenza

Telefono in caso di urgenza	Telefono: +39 06 4997 0698 Descrizione: Centre Antiveleni
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### SEZIONE 2: Identificazione dei pericoli

#### 2.1. Classificazione della sostanza o della miscela

Classificazione conforme alla Normativa (CE) N. 1272/2008 [CLP/GHS]	Expl. 1.1; H201 Acute tox. 4; H302
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Proprietà pericolose di sostanza / miscela	Acute tox. 3; H311 Esplosivo; pericolo di esplosione di massa. Nocivo per ingestione. Tossico a contatto con la pelle.
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## 2.2. Elementi dell'etichetta

Pittogrammi di pericolo (CLP)	
 	Le avvertenze
	Indicazioni di pericolo
	Consigli di prudenza
	Pericolo
	H201 Esplosivo; pericolo di esplosione di massa. H302 Nocivo se ingerito. H311 Tossico per contatto con la pelle. P210 Tenere lontano da fonti di calore / scintille / fiamme libere / superfici riscaldate. – Non fumare. P250 Evitare le abrasioni / gli urti / gli attriti / . P280 Indossare guanti / indumenti protettivi / Proteggere gli occhi / il viso. P370+P380 Evacuare la zona in caso di incendio. P372 Rischio di esplosione in caso di incendio. P373 NON utilizzare mezzi estinguenti se l'incendio raggiunge materiali esplosivi.

## 2.3. Altri pericoli

PBT / vPvB	Non è PBT / vPvB.
Effetto sulla salute	Convulsioni e scarso coordinamento sono stati riportati in esperimenti su animali.

## SEZIONE 3: Composizione/informazioni sugli ingredienti

### 3.2. Miscele

Nome del componente	Identificazione	Classificazione	Contenuti
1,3,5,7-Tetranitro-1,3,5,7-tetraazacyklooctan (HMX)	N. CAS: 2691-41-0	Expl. 1.1;H201	90 - 100 %
	Num. CE: 220-260-0	Acute tox. 4; H302	
	N. reg. REACH: 01-2119964438-25	Acute tox. 3; H311	
Viton A (Fluoroelastomero)			4 -6 %
Grafite	N. CAS: 7782-42-5		0 - 5 %
	Num. CE: 231-955-3		
Descrizione della miscela	Sostanza 3 è solamente in PBXN-5/Grafite.		
Osservazioni relative ai componenti	Consultare la sezione 16 per la spiegazione delle indicazioni di pericolo (H). Pour les substances qui n'ont pas de numéro d'enregistrement REACH, cela n'est pas spécifié par le fabricant.		

## SEZIONE 4: Misure di primo soccorso

### 4.1. Descrizione delle misure di primo soccorso

Generalità	Numero telefonico di emergenza: vedi sezione 1.4. In caso di incidenti incoscienza o
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	grave, chiamare 112.
Inalazione	Aria fresca, calma e caldo. Consultare un medico se il disturbo continua.
Contatto con la pelle	Togliere gli indumenti contaminati. Lavarsi immediatamente con acqua e sapone. Consultare immediatamente un medico!
Contatto con gli occhi	Sciacquare immediatamente con abbondante acqua per non più di 15 minuti. Togliere eventuali lenti a contatto ed aprire bene gli occhi. Consultare un medico se il disturbo continua.
Ingestione	Bere alcuni bicchieri di acqua o latte. Provocare il vomito, se la persona è cosciente. Consultare un medico. Lavoratore inconscio trasportato immediatamente in ospedale.

## 4.2. Principali sintomi ed effetti, sia acuti che ritardati

Sintomi ed effetti acuti	Tossico a contatto con la pelle. L'ingestione o l'inalazione di polvere può causare intossicazione acuta o cronica. I sintomi includono mal di testa, convulsioni, insonnia e nausea.
Sintomi ed effetti ritardati	Crisi convulsive possono verificarsi molte ore dopo l'esposizione.

## 4.3. Indicazione della eventuale necessità di consultare immediatamente un medico e di trattamenti speciali

Altre informazioni	Trattamento sintomatico.
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# SEZIONE 5: Misure antincendio

## 5.1. Mezzi di estinzione

Mezzo di estinzione adeguato	Spegnere gli incendi circostanti con estintore idoneo.
Mezzo di estinzione non appropriato	Non tentare di spegnere l'incendio causato dall'esplosivo, il fuoco può provocare un'esplosione! Il fuoco causato dall'esplosivo NON deve essere soffocato con alcun agente estinguente (schiuma, polvere chimica, anidride carbonica o sabbia). Ogni tentativo AUMENTA il rischio di esplosione.

## 5.2. Pericoli speciali derivanti dalla sostanza o dalla miscela

Rischi di incendio e di esplosione	Rischio di esplosione per urto, sfregamento, fuoco o altre sorgenti d'ignizione. Incendio / esplosione forma gas tossici come gli ossidi di carbonio (CO, CO <sub>2</sub> ) e ossidi di azoto (NO, NO <sub>2</sub> e N <sub>2</sub> O <sub>4</sub> ).
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## 5.3. Raccomandazioni per gli addetti all'estinzione degli incendi

Attrezzatura di protezione individuale	Impiegare una maschera di protezione ad aria libera quando il prodotto viene coinvolto in un incendio. In caso di evacuazione, impiegare maschere approvate a quest'uso. Vedi anche sezione 8.
Altre informazioni	Fermare ogni tipo di traffico ed evacuare l'area intorno al incendio a sufficiente distanza di sicurezza rispetto a possibile esplosione o incendio dovuto al gas. Contattare immediatamente la polizia e vigili del fuoco. I contenitori vicini al fuoco devono essere allontanati o raffreddati con acqua.

# SEZIONE 6: Misure in caso di rilascio accidentale

## 6.1. Precauzioni personali, dispositivi di protezione e procedure in caso di emergenza

### Precauzioni individuali

Evitare il contatto con la pelle e gli occhi. Evitare l'inalazione di polvere. Utilizzare dispositivi di protezione individuale, come specificato nel punto 8.

## 6.2. Precauzioni ambientali

### Precauzioni per la protezione dell'ambiente

Impedire lo scarico di fogna, le vie o terra.

## 6.3. Metodi e materiali per il contenimento e per la bonifica

### Pulizia

Inumidire con acqua prima dell'uso. La sporcizia deve essere rimossa con una pala di legno o di alluminio e deve essere posta in un contenitore adeguato per poi essere bruciata.

## 6.4. Riferimenti ad altre sezioni

### Altre istruzioni

Vedere sezioni 7 e 8.

# SEZIONE 7: Manipolazione e immagazzinamento

## 7.1. Precauzioni per la manipolazione sicura

### Manipolazione

Solamente personale qualificato utilizzerà il prodotto.  
Posto sotto la vigilanza e inaccessibile a persone non autorizzate. Conservare lontano da fiamme e scintille - Non fumare. Proteggere contro il calore. Pericolo di esplosione per urto o riscaldamento. Proteggere da danni fisici e/o attriti. Evitare trattamenti che generino polvere.

## Misure protettive

### Consigli sulle norme igieniche generali sul lavoro

Lavare le mani dopo l'uso. Togliere gli indumenti contaminati e i dispositivi di protezione prima di accedere alle zone in cui si mangia. Non mangiare, bere e fumare nelle zone di lavoro.

## 7.2. Condizioni per l'immagazzinamento sicuro, comprese eventuali incompatibilità

### Stoccaggio

Conservare in ambiente asciutto e ventilato.  
Tenere al sicuro dal fuoco in un deposito approvato chiuso a chiave.  
Conservare lontano da: fonti di ignizione.  
Conservare tra 0 e 30 °C.  
Conformarsi normative nazionali per quanto riguarda la manipolazione di esplosivi.

## Condizioni per lo stoccaggio sicuro

### Suggerimenti sulla conservazione

Tenere lontano da: Agenti ossidanti.

## 7.3. Usi finali specifici

### Utilizzazione(i) particolare(i)

Vedere sezioni 1.2.

# SEZIONE 8: Controllo dell'esposizione/protezione individuale

## 8.1. Parametri di controllo

Nome del componente	Identificazione	Valore	Anno
Grafite, tutte le forme, escluso le fibre di grafite, frazione respirabile	N. CAS: 7782-42-5	VME (8h) : 2 mg/m <sup>3</sup>	
Altre indicazioni sui valori limiti	Riferimenti (legislazione/regolamentazione): Valori limite di esposizione professionale.		

## 8.2. Controlli dell'esposizione

### Misure preventive per la prevenzione dell'esposizione

Misure tecniche per prevenire l'esposizione	<p>Luogo ben ventilato. I dispositivi di protezione individuale devono essere marcati CE e dovrebbero essere scelti in accordo con il fornitore di tali attrezzature.</p> <p>Le attrezzature di protezione consigliate e le norme indicate sono puramente indicative. Le norme devono essere della versione più recente.</p> <p>La valutazione del rischio sul posto di lavoro corrente / operativo (rischio effettivo) può portare ad altre misure di controllo. I dispositivi di protezione adeguati e la durevolezza di protezione dipenderanno dall'applicazione.</p>
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### Protezioni per occhi / volto

Dispositivo di protezione oculare	<p>Descrizione: Portare occhiali di protezione aderenti se si formano polveri.</p> <p>Riferimento a standard rilevanti: EN 166.</p>
Misure aggiuntive di protezione oculare	<p>Posto di lavaggio oculare dovrebbe essere sul posto di lavoro. Se un'unità fissa collegata all'acqua potabile (acqua calda preferita) o un dispositivo monouso portatile (bottiglia collirio).</p>

### Protezione delle mani

Tempo di avanzamento	Osservazioni: Non rilevante.
Spessore del materiale dei guanti	Osservazioni: Sconosciuto.
Dispositivi di protezione per le mani	<p>Descrizione: Usare guanti protettivi adatti in caso di rischio di contatto con la pelle. Non si sconsiglia nessun materiale in particolare, il prodotto non penetra la plastica o la gomma. Spessore del guanto deve essere scelto in consultazione con il fornitore di guanti.</p> <p>Riferimento a standard rilevanti: EN 374. EN 420.</p>

### Protezione della pelle

Abbigliamento protettivo adatto	Utilizzare adeguate indumenti protettivi per evitare il contatto con la pelle.
Misure aggiuntive di protezione per la pelle	I vestiti che sono stati bagnati o contaminati devono essere sostituiti. Garantire un facile accesso ad acqua corrente o ad una doccia d'emergenza.

### Protezione respiratoria

Protezione respiratoria consigliata	<p>Descrizione: Normalmente non obbligatorio. Usare maschera con filtro P2, in caso di formazione di polvere.</p> <p>Riferimento a standard rilevanti: EN 143.</p>
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## Controllo di esposizione ambientale adatto

Controlli dell'esposizione ambientale	Impedire lo scarico di fogna, le vie o terra.
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## SEZIONE 9: Proprietà fisiche e chimiche

### 9.1. Informazioni sulle proprietà fisiche e chimiche fondamentali

Stato fisico	Solido. / Granulato.
Colore	Bianco. PBXN-5/Grafite: grigio
Odore	Nessuno.
Soglia di odore	Osservazioni: Non rilevante.
pH	Osservazioni: Non rilevante.
Punto / intervallo di fusione	Valore: ~ 280 °C
Punto di ebollizione	Osservazioni: Non applicabile in quanto la sostanza si decompone senza far bollire.
Punto di infiammabilità	Osservazioni: Non rilevante. (Solidi)
Tasso di evaporazione	Osservazioni: Non rilevante.
Infiammabilità (solidi, gas)	Rinuncia. Sostanza ha proprietà esplosive.
Limite di esplosività	Osservazioni: Non fornito.
Pressione di vapore	Osservazioni: Non rilevante.
Densità di vapore	Osservazioni: Non fornito.
Densità	Valore: 1,9 g/cm <sup>3</sup>
Solubilità	Medio: Acqua Osservazioni: Inestricabilmente.
coefficiente di divisione: n-octanol/acqua	Osservazioni: Non rilevante.
Combustibilità spontanea	Osservazioni: Non fornito.
Temperatura di decomposizione	Valore: ~ 280 °C
Viscosità	Osservazioni: Non rilevante. (Solidi a temperatura ambiente e pressione normale).
Proprietà esplosive	Esplosive.
Proprietà ossidanti	Prova non eseguita. La miscela è esplosiva.

### 9.2. Altre informazioni

#### Altre proprietà fisiche e chimiche

Osservazioni	Non ci sono ulteriori dati pertinenti disponibili.
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## SEZIONE 10: Stabilità e reattività

### 10.1. Reattività

Reattività	Nessun pericolo di reattività.
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## 10.2. Stabilità chimica

Stabilità	Stabile a temperature normali e se utilizzato secondo le raccomandazioni d'uso.
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## 10.3. Possibilità di reazioni pericolose

Possibilità di reazioni pericolose	Pericolo di esplosione se mescolato con sostanze comburenti.
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## 10.4. Condizioni da evitare

Condizioni da evitare	Rischio di esplosione per urto, sfregamento, fuoco o altre sorgenti d'ignizione
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## 10.5. Materiali incompatibili

Materie da evitare	Agenti ossidanti.
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## 10.6. Prodotti di decomposizione pericolosi

Prodotti di decomposizione pericolosi	La degradazione termica o la combustione possono liberare ossidi di carbonio ed altri gas o vapori tossici. Gas azotati (Nox).
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# SEZIONE 11: Informazioni tossicologiche

## 11.1. Informazioni sugli effetti tossicologici

Componente	1,3,5,7-Tetranitro-1,3,5,7-tetraazacyklooctan (HMX)
Tossicità acuta	<p><b>Tipo di tossicità:</b> Acuto</p> <p><b>Effetto testato:</b> LD50</p> <p><b>Percorso di esposizione:</b> Orale</p> <p><b>Valore:</b> 1670 mg/kg</p> <p><b>Speci di animali di laboratorio:</b> mouse</p> <p><b>Osservazioni:</b> Key study</p> <p><b>Tipo di tossicità:</b> Acuto</p> <p><b>Effetto testato:</b> LD50</p> <p><b>Percorso di esposizione:</b> Pelle</p> <p><b>Valore:</b> 634 mg/kg</p> <p><b>Speci di animali di laboratorio:</b> coniglio</p> <p><b>Osservazioni:</b> Key study</p>

## Altre informazioni riguardanti i rischi di salute

Valutazione della tossicità acuta, classificazione	Nocivo se ingerito. Tossico per contatto con la pelle.
Valutazione della corrosione / irritazione, classificazione	Basandosi sui dati disponibili i criteri di classificazione non sono soddisfatti.
Valutazione della lesione o dell'irritazione oculare, classificazione	Basandosi sui dati disponibili i criteri di classificazione non sono soddisfatti.
Valutazione della sensibilizzazione delle vie respiratorie, classificazione	Basandosi sui dati disponibili i criteri di classificazione non sono soddisfatti.

Valutazione della sensibilizzazione cutanea, classificazione	Basandosi sui dati disponibili i criteri di classificazione non sono soddisfatti.
Valutazione della mutagenicità di cellule germinali, classificazione	Basandosi sui dati disponibili i criteri di classificazione non sono soddisfatti.
Valutazione della cancerogenicità, classificazione	Basandosi sui dati disponibili i criteri di classificazione non sono soddisfatti.
Valutazione della tossicità per la riproduzione, classificazione	Basandosi sui dati disponibili i criteri di classificazione non sono soddisfatti.
Valutazione della SE specifica per organi bersaglio, classificazione	Basandosi sui dati disponibili i criteri di classificazione non sono soddisfatti.
Valutazione della RE specifica per organi bersaglio, classificazione	Basandosi sui dati disponibili i criteri di classificazione non sono soddisfatti.
Valutazione del pericolo di aspirazione, classificazione	Basandosi sui dati disponibili i criteri di classificazione non sono soddisfatti.

## Sintomi da esposizione

In caso di ingestione	L'ingestione o l'inalazione di polvere può causare intossicazione acuta o cronica. I sintomi includono mal di testa, convulsioni, insonnia e nausea. Crisi convulsive possono verificarsi molte ore dopo l'esposizione. Nocivo per ingestione. Sintomi di avvelenamento come mal di testa, affaticamento, mancanza di respiro possono verificarsi.
In caso di contatto con la pelle	Tossico per contatto con la pelle. Pelle penetrazione possibile.
In caso di inalazione	L'ingestione o l'inalazione di polvere può causare intossicazione acuta o cronica. I sintomi includono mal di testa, convulsioni, insonnia e nausea. Crisi convulsive possono verificarsi molte ore dopo l'esposizione.
In caso di contatto con gli occhi	Polvere può dare irritazione meccanica agli occhi. Può causare bruciore ed arrossamento.

## SEZIONE 12: Informazioni ecologiche

### 12.1. Tossicità

Componente	1,3,5,7-Tetranitro-1,3,5,7-tetraazacyklooctan (HMX)
Tossicità acquatica acuta, pesci	<b>Valore:</b> 15 mg/l <b>Durata del test:</b> 96 h <b>Specie:</b> pimephales promelas <b>Metodo:</b> LC50
Componente	1,3,5,7-Tetranitro-1,3,5,7-tetraazacyklooctan (HMX)
Tossicità acquatica acuta, alghe	<b>Valore:</b> > 6,5 mg/l <b>Durata del test:</b> 96 h <b>Specie:</b> Scenedesmus capricornutum <b>Metodo:</b> EC50



Componente	1,3,5,7-Tetranitro-1,3,5,7-tetraazacyklooctan (HMX)
Tossicità acquatica acuta, dafnie	<b>Valore:</b> > 15 mg/l <b>Durata del test:</b> 48 h <b>Specie:</b> Daphnia magna <b>Metodo:</b> EC50
Ecotossicità	Prodotto classificato non pericoloso per l'ambiente.

## 12.2. Persistenza e degradabilità

Persistenza e degradabilità, commenti	Persistente in condizioni aerobiche.
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## 12.3. Potenziale di bioaccumulo

Potenziale di bioaccumulazione	Non è bioaccumulabile. Log Pow = 0,16
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## 12.4. Mobilità nel suolo

Mobilità	Il prodotto è poco solubile in acqua.
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## 12.5. Risultati della valutazione PBT e vPvB

Risultati di valutazione PBT	Il prodotto non contiene sostanze PBT.
Risultati valutazione vPvB	Il prodotto non contiene sostanze vPvB.

## 12.6. Altri effetti avversi

Altri effetti nefasti / altre informazioni	Impedire lo scarico di fogna, le vie o terra.
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# SEZIONE 13: Considerazioni sullo smaltimento

## 13.1. Metodi di trattamento dei rifiuti

Precisare i metodi di eliminazione adeguati	I resti di esplosivi devono essere rimossi, curati (o riconfezionato in imballaggi approvati), stoccati provisoriamente e al più presto distrutti in modo adeguato.
Codice rifiuti CED	Contattare le autorità locali in materia trattamento dei rifiuti di esplosivi.
Altre informazioni	Classificato come rifiuto pericoloso: Si
	Non gettare i residui nelle fognature.

# SEZIONE 14: Informazioni sul trasporto

## 14.1. Numero ONU

ADR / RID / ADN	0484
IMDG	0484
ICAO / IATA	0484

## 14.2. Nome di spedizione dell'ONU

ADR / RID / ADN	HMX DESENSIBILIZZATA
IMDG	HMX, DESENSITIZED
ICAO / IATA	HMX, DESENSITIZED

### 14.3. Classi di pericolo connesso al trasporto

ADR / RID / ADN	1.1D
IMDG	1.1D
ICAO / IATA	1.1D

### 14.4. Gruppo di imballaggio

Osservazioni	Non rilevante.
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### 14.5. Pericoli per l'ambiente

Inquinamento marino	No
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### 14.6. Precauzioni speciali per gli utilizzatori

Precauzioni speciali per gli utilizzatori	Sconosciuto.
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### 14.7. Trasporto di rinfuse secondo l'allegato II di MARPOL 73/78 ed il codice IBC

Categoria di inquinamento	Non rilevante.
ADR Altre informazioni utili	Istruzioni d'emballage: P112(b) (c)
RID Altre informazioni utili	Istruzioni d'emballage: P112(b) (c)

### IMDG/ICAO/IATA Altre informazioni

EmS	F-B, S-Y
ICAO/IATA Altre informazioni utili	PROIBITO

## SEZIONE 15: Informazioni sulla regolamentazione

### 15.1. Norme e legislazione su salute, sicurezza e ambiente specifiche per la sostanza o la miscela

Riferimenti (legislazione/regolamentazione)	Direttiva 1272/2008/CE e relativi emendamenti (Regolamento CLP) Regolamento (CE) n. 1907/2006 del Parlamento europeo e del Consiglio, del 18 dicembre 2006, concernente la registrazione, la valutazione, l'autorizzazione e la restrizione delle sostanze chimiche (REACH) Direttiva del Consiglio del 15 luglio 1975 relativa ai rifiuti (75/442/CEE). Normative nazionali per quanto riguarda la manipolazione di esplosivi. (Direttiva 93/15 CEE) Regolamento ADR/RID.
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### 15.2. Valutazione della sicurezza chimica

Valutazione sicurezza chimica eseguita	No
Richiesta CRS (relazione sulla sicurezza chimica)	No

## SEZIONE 16: Altre informazioni

Appunti del fornitore	Le informazioni contenute in questo documento devono essere disponibili per tutte le persone a contatto con il prodotto.
Elenco di frasi di rischio rilevanti (sezioni 2 e 3).	H201 Esplosivo; pericolo di esplosione di massa. H302 Nocivo se ingerito. H311 Tossico per contatto con la pelle.
Classificazione CLP	Expl. 1.1; H201 Acute tox. 4; H302 Acute tox. 3; H311
Restrizioni di impiego raccomandate	Questo prodotto può essere consegnato solo agli utenti con un permesso di acquisto valido rilasciato dalla polizia o sceriffo.
Fonti dei principali dati utilizzati per lo stabilimento di schede di sicurezza	Schede di dato di sicurezza del Chemring Nobel AS (HMX) datado 03.10.2013.
Abbreviazioni e acronimi utilizzati	ADN: The European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways ADR: The European Agreement concerning the International Carriage of Dangerous Goods by Road EC50: La concentrazione effettiva della sostanza che causa il 50% della risposta massima IATA: The International Air Transport Association IBC: Intermediate Bulk Container. ICAO: The International Civil Aviation Organisation IMDG: The International Maritime Dangerous Goods Code CL50: (Concentrazione Letale 50) esprime la concentrazione di sostanza attiva che causa la morte del 50 % degli animali test di laboratorio esposti al prodotto DL50: (Dose Letale 50) quantità di sostanza attiva in grado di uccidere il 50% degli animali test di laboratorio Log Pow: Coefficiente di divisione: n-octanol/acqua MARPOL 73/78: the International Convention for the Prevention of Pollution from Ships, 1973 come modificato da "the Protocol of 1978". ("MARPOL" è l'abbreviazione di marine pollution e 73/78 abbreviazione per gli anni 1973 e 1978.) PBT: Persistenti, bioaccumulabili e tossiche PC: chemical Product Category. Categoria dei prodotti chimici. RID: The Regulations concerning the International Carriage of Dangerous Goods by Rail vPvB: very Persistent and very Bioaccumulative (molto persistenti e molto bioaccumulabili)
Informazioni aggiunte, sopprese o modificate	Nuova scheda di sicurezza.
Verifica della qualità delle informazioni	La qualità di questa scheda di sicurezza è controllata dal Kiwa Teknologisk Institutt (ISO 9001:2008).
Versione	1

Preparata da

Kiwa Teknologisk Institutt, Norvegia v/ Gro Sand.

# Exposure Scenarios

Attachment to Safety Data Sheet

## HMX

CAS: 2691-41-0

EC: 220-260-0

Chemical name: Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocin

REACH registration number: 01-2119964438-25-0001

Valid from: 28.10.2013

Version No.: 1

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**HMX is classified as an explosive Div.1.1 H201 under GHS and E R2 under DSD.**  
**Workers handling HMX should refer to Section 4-8 of SDS which contains the guidance on safe use of HMX.**

## Exposure Scenario 1: Manufacture of HMX

**Processes, tasks, activities covered:** Manufacture of the substance, includes recycling/recovery, material transfers, storage, sampling, associated laboratory activities, maintenance, transport and laboratory activities

### Section 1: List of all use descriptors

Sector of use:	
Process category:	<b>PROC3:</b> Use in closed batch process <b>PROC9:</b> Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
Environmental Release Category:	<b>ERC1:</b> Manufacture of substances

### Section 2. Operational Conditions and risk management measures

#### 2.1 Control of workers exposure for PROC3, PROC9

Operational Conditions (OC)	
Physical form of product	White crystalline powder (solid)
Dustiness of material	Covers non or low-dusty materials (e.g. pellets, granules, sugar, salt)
Vapour pressure	0.00000321 Pa at 25 °C
Concentration of substance in product	Covers percentage substance in the product up to 100 %
Frequency and duration of use/exposure	Avoid carrying out activities involving exposure for more than 1 hour
Other Operational Conditions of use affecting workers exposure	
Place of use	Indoor use
Process temperature (for solid)	Covers use at ambient temperatures
<b>General information on risk management related to physicochemical hazard:</b>	HMX is classified as an explosive Div.1.1 H201 under GHS. Workers handling HMX should refer to Section 4-8 of SDS which contains the guidance on safe use of HMX.

#### 2.1.1 Manufacture of HMX in closed batch process (PROC3)

Conditions of use	The manufacture of HMX takes place in a reactor which is controlled remotely with no exposure to workers. Exposure to workers occurs while filtering, sampling, extracting impurities or connection of hoses at different stages of purification, crystallisation and wet or jet-milling of HMX.
Containment	Use in closed batch process (synthesis or formulation)

Risk Management Measures (RMM)	
General	HMX is classified as acutely toxic in contact with skin and harmful if swallowed. Workers working with HMX are required to wear protective equipment and ducting/ventilation system is required at workplace for any operations for which there is a possibility for accidental skin contact and inhalation.
<b>Technical and organisational conditions and measures</b>	Provide a basic standard of general ventilation (1 to 3 air changes per hour). Advanced (industrial) exposure controls assumed.

#### Conditions and measures related to personal protection, hygiene and health evaluation

Dermal protection	Hand protection	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. For further specification, refer to section 8 of the SDS
	Skin protection	Wear appropriate protective clothing to protect against skin contact.
Respiratory Protection		Wear a respirator providing a minimum efficiency of 95 %. For further specification, refer to section 8 of the SDS.
Eye protection		Use tight fitting goggles if dust is generated.

#### 2.1.2 Transfer of HMX into containers/vessels (PROC 9)

Conditions of use	Transfer of substance or preparation into small containers for storage and laboratory activities.
Containment	Use in semi-closed process with opportunity for exposure

Risk Management Measures (RMM)	
General	HMX is classified as acutely toxic in contact with skin and harmful if swallowed. Workers working with HMX are required to wear protective equipment and ducting/ventilation system is required at workplace for any operations for which there is a possibility for accidental skin contact and inhalation.
<b>Technical and organisational conditions and measures</b>	Provide a basic standard of general ventilation (1 to 3 air changes per hour). Local exhaust ventilation - efficiency of at least 90 % Advanced (industrial) exposure controls assumed.

#### Conditions and measures related to personal protection, hygiene and health evaluation

Dermal protection	Hand protection	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. For further specification, refer to section 8 of the SDS
	Skin protection	Wear appropriate protective clothing to protect against skin contact.

Respiratory Protection	Wear a respirator providing a minimum efficiency of 95 % For further specification, refer to section 8 of the SDS.
Eye protection	Use tight fitting goggles if dust is generated.
<b>2.2 Control of environmental exposure</b>	
<b>2.2.1 Manufacture (ERC 1)</b>	
Amounts used	Daily amount per site < 5 tonnes/day Annual amount per site < 999 tonnes/year
Conditions and measures related to sewage treatment plant	Assumed domestic sewage treatment plant flow >2000 m <sup>3</sup> /day No application of sludge to soil
Conditions and measures related to treatment of waste (including article waste)	Dispose of waste or used sacks/containers according to local regulations. (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.)
Other conditions affecting environmental exposure	Receiving surface water flow > 18000 m <sup>3</sup> /d
Methods for cleaning	Moisten with water before handling. Spillage should be removed with an aluminium or wooden shovel and placed in a suitable container for later burning. Dispose of in accordance with local regulations for waste handling.
Environmental precautions	Do not allow to enter into sewer, water system or soil.

### Section 3. Exposure and risk estimation

#### 3.1 Health

*When the recommended risk management measures (RMMs) and operational conditions (OCs) are adopted, exposures are not expected to exceed the predicted derived no-effect levels (DNELs) and the resulting risk characterization ratio (RCR) are expected to be less than 1.*

Manufacture of HMX in closed batch process (PROC 3)

	Predicted Exposure	RCR	Method	Reference values
Inhalation	0,001 mg/m <sup>3</sup>	< 0,01	TRA Worker	DNEL : 0,28 mg/m <sup>3</sup>
Dermal	0.007 mg/kg bw/day	0,012	TRA Worker	DNEL: 0,6 mg/kg bw/day
All routes		0,015	TRA Worker	

Transfer of HMX into containers/vessels (PROC 9)

	Predicted Exposure	RCR	Method	Reference values
Inhalation	1E-4 mg/m <sup>3</sup>	< 0.01	TRA Worker	DNEL : 0,28 mg/m <sup>3</sup>
Dermal	0.007 mg/kg bw/day	0.011	TRA Worker	DNEL: 0,6 mg/kg bw/day
All routes		0.012	TRA Worker	

#### 3.2 Environment

As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed.

##### 2.3.2.1 Man via the environment

*Exposure of humans via the environment are below the long term systemic derived no-effect levels (DNELs) derived for the general population demonstrating that the manufacture of HMX is safe for human health when exposure (oral and inhalation) is via the environment.*

	Predicted Exposure	RCR	Reference values
<b>Inhalation</b> Local PEC (mg/m <sup>3</sup> )	1.074E-10 mg/m <sup>3</sup>	< 0,01	DNEL: 0,14 mg/m <sup>3</sup>
<b>Oral</b> Exposure via food consumption (mg/kg bw/day)	0.017 mg/kg bw/da	0.846	DNEL: 0,02 mg/kg bw/da
<b>Combined routes</b>		0.846	

### Section 4: Guidance to check compliance with the exposure scenario

#### 4.1 Health

Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.

#### 4.2 Environment

Not applicable.

## Exposure Scenario 2: Formulation

**Processes, tasks, activities covered:** Formulation, packing and repacking of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, crystallization, tableting, compression, pelletization, extrusion, large and small scale packing, maintenance, sampling, distribution and laboratory activities

### Section 1: List of all use descriptors

Sector of use:	
Process category:	<b>PROC3:</b> Use in closed batch process <b>PROC9:</b> Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
Environmental Release Category:	<b>ERC2:</b> Formulation of preparations

### Section 2. Operational Conditions and risk management measures

#### 2.1 Control of workers exposure for PROC3, PROC9

Operational Conditions (OC)	
Physical form of product	White crystalline powder (solid)
Dustiness of material	Covers non or low-dusty materials (e.g. pellets, granules, sugar, salt)
Vapour pressure	0.00000321 Pa at 25 °C
Concentration of substance in product	Covers percentage substance in the product up to 100 %
Frequency and duration of use/exposure	Avoid carrying out activities involving exposure for more than 1 hour
Other Operational Conditions of use affecting workers exposure	
Place of use	Indoor use
Process temperature (for solid)	Covers use at ambient temperatures
<b>General information on risk management related to physicochemical hazard:</b>	HMX is classified as an explosive Div.1.1 H201 under GHS. Workers handling HMX should refer to Section 4-8 of SDS which contains the guidance on safe use of HMX.

#### 2.1.1 Formulation of HMX mixtures in closed batch process (PROC3)

Conditions of use	Formulation in closed batch process including packing and repacking of the substance and its mixtures in batch or continuous operations, storage, materials transfers, mixing, crystallization, tableting, compression, pelletization, extrusion, large and small scale packing, maintenance, sampling, distribution
Containment	Use in closed batch process (synthesis or formulation)
Risk Management Measures (RMM)	
General	HMX is classified as acutely toxic in contact with skin and harmful if swallowed. Workers working with HMX are required to wear protective equipment and ducting/ventilation system is required at workplace for any operations for which there is a possibility for accidental skin contact and inhalation.
<b>Technical and organisational conditions and measures</b>	Provide a basic standard of general ventilation (1 to 3 air changes per hour) Advanced (industrial) exposure controls assumed.
Conditions and measures related to personal protection, hygiene and health evaluation	
Dermal protection	Hand protection
	Skin protection
Respiratory Protection	Wear a respirator providing a minimum efficiency of 95 %. For further specification, refer to section 8 of the SDS.
Eye protection	Use tight fitting goggles if dust is generated.

#### 2.1.2 Transfer of HMX mixtures into containers/vessels (PROC 9)

Conditions of use	Transfer of substance or preparation into small containers for storage and laboratory activities.
Containment	Use in semi-closed process with opportunity for exposure
Risk Management Measures (RMM)	
General	HMX is classified as acutely toxic in contact with skin and harmful if swallowed. Workers working with HMX are required to wear protective equipment and ducting/ventilation system is required at workplace for any operations for which there is a possibility for accidental skin contact and inhalation.
<b>Technical and organisational conditions and measures</b>	Provide a basic standard of general ventilation (1 to 3 air changes per hour). Local exhaust ventilation - efficiency of at least 90 % Advanced (industrial) exposure controls assumed.
Conditions and measures related to personal protection, hygiene and health evaluation	
Dermal protection	Hand protection



Skin protection	Wear appropriate protective clothing to protect against skin contact.
Respiratory Protection	Wear a respirator providing a minimum efficiency of 90 % For further specification, refer to section 8 of the SDS.
Eye protection	Use tight fitting goggles if dust is generated.

## 2.2 Control of environmental exposure

### 2.2.1 Formulation (ERC 2)

Amounts used	Daily amount per site <5 tonnes/day Annual amount per site <25 tonnes/year
Conditions and measures related to sewage treatment plant	Assumed domestic sewage treatment plant flow >2000 m3/day No application of sludge to soil
Conditions and measures related to treatment of waste (including article waste)	Dispose of waste or used sacks/containers according to local regulations. (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.)
Other conditions affecting environmental exposure	Receiving surface water flow > 18000 m3/d
Methods for cleaning	Moisten with water before handling. Spillage should be removed with an aluminium or wooden shovel and placed in a suitable container for later burning. Dispose of in accordance with local regulations for waste handling.
Environmental precautions	Do not allow to enter into sewer, water system or soil.

## Section 3. Exposure and risk estimation

### 3.1 Health

*When the recommended risk management measures (RMMs) and operational conditions (OCs) are adopted, exposures are not expected to exceed the predicted derived no-effect levels (DNELs) and the resulting risk characterization ratio (RCR) are expected to be less than 1.*

Formulation of HMX mixtures in closed batch process (PROC 3)

	Predicted Exposure	RCR	Method	Reference values
Inhalation	0,001 mg/m <sup>3</sup>	< 0,01	TRA Worker	DNEL : 0,28 mg/m <sup>3</sup>
Dermal	0.014 mg/kg bw/day	0,023	TRA Worker	DNEL: 0,6 mg/kg bw/day
All routes		0,027	TRA Worker	

Transfer of HMX mixtures into containers/vessels (PROC 9)

	Predicted Exposure	RCR	Method	Reference values
Inhalation	2E-4 mg/m <sup>3</sup>	< 0.01	TRA Worker	DNEL : 0,28 mg/m <sup>3</sup>
Dermal	0.007 mg/kg bw/day	0.011	TRA Worker	DNEL: 0,6 mg/kg bw/day
All routes		0.012	TRA Worker	

### 3.2 Environment

As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed.

#### 2.3.2.1 Man via the environment

*Exposure of humans via the environment are below the long term systemic derived no-effect levels (DNELs) derived for the general population demonstrating that the manufacture of HMX is safe for human health when exposure (oral and inhalation) is via the environment.*

	Predicted Exposure	RCR	Reference values
<b>Inhalation</b> Local PEC (mg/m <sup>3</sup> )	1.904E-5 mg/m <sup>3</sup>	< 0,01	DNEL: 0,14 mg/m <sup>3</sup>
<b>Oral</b> Exposure via food consumption (mg/kg bw/day)	0.004mg/kg bw/da	0,199	DNEL: 0,02 mg/kg bw/da
<b>Combined routes</b>		0,199	

## Section 4: Guidance to check compliance with the exposure scenario

### 4.1 Health

Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.

### 4.2 Environment

Not applicable.

### Exposure Scenario 3: Formulation

**Processes, tasks, activities covered:** Formulation, packing and repacking of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, crystallization, tableting, compression, pelletization, extrusion, large and small scale packing, maintenance, sampling, distribution and laboratory activities

#### Section 1: List of all use descriptors

Sector of use:	
Process category:	<b>PROC3:</b> Use in closed batch process <b>PROC9:</b> Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
Environmental Release Category:	<b>ERC3:</b> Formulation in materials

#### Section 2. Operational Conditions and risk management measures

##### 2.1 Control of workers exposure for PROC3, PROC9

Operational Conditions (OC)	
Physical form of product	White crystalline powder (solid)
Dustiness of material	Covers non or low-dusty materials (e.g. pellets, granules, sugar, salt)
Vapour pressure	0.00000321 Pa at 25 °C
Concentration of substance in product	Covers percentage substance in the product up to 100 %
Frequency and duration of use/exposure	Avoid carrying out activities involving exposure for more than 1 hour
Other Operational Conditions of use affecting workers exposure	
Place of use	Indoor use
Process temperature (for solid)	Covers use at ambient temperatures
<b>General information on risk management related to physicochemical hazard:</b>	HMX is classified as an explosive Div.1.1 H201 under GHS. Workers handling HMX should refer to Section 4-8 of SDS which contains the guidance on safe use of HMX.

##### 2.1.1 Formulation of HMX in materials in closed batch process (PROC3)

Conditions of use	Formulation of HMX in materials in closed batch process including packing and repacking of the substance and its mixtures in batch or continuous operations, storage, materials transfers, mixing, crystallization, tableting, compression, pelletization, extrusion, large and small scale packing, maintenance, sampling, distribution
Containment	Use in closed batch process (synthesis or formulation)
Risk Management Measures (RMM)	
General	HMX is classified as acutely toxic in contact with skin and harmful if swallowed. Workers working with HMX are required to wear protective equipment and ducting/ventilation system is required at workplace for any operations for which there is a possibility for accidental skin contact and inhalation.
<b>Technical and organisational conditions and measures</b>	Provide a basic standard of general ventilation (1 to 3 air changes per hour) Advanced (industrial) exposure controls assumed.
Conditions and measures related to personal protection, hygiene and health evaluation	
Dermal protection	Hand protection
	Skin protection
Respiratory Protection	Wear a respirator providing a minimum efficiency of 95 %. For further specification, refer to section 8 of the SDS.
Eye protection	Use tight fitting goggles if dust is generated.

##### 2.1.2 Transfer of HMX in materials into containers/vessels (PROC 9)

Conditions of use	Transfer of HMX in materials into small containers for storage and laboratory activities.
Containment	Use in semi-closed process with opportunity for exposure
Risk Management Measures (RMM)	
General	HMX is classified as acutely toxic in contact with skin and harmful if swallowed. Workers working with HMX are required to wear protective equipment and ducting/ventilation system is required at workplace for any operations for which there is a possibility for accidental skin contact and inhalation.
<b>Technical and organisational conditions and measures</b>	Provide a basic standard of general ventilation (1 to 3 air changes per hour). Local exhaust ventilation - efficiency of at least 90 % Advanced (industrial) exposure controls assumed.

Conditions and measures related to personal protection, hygiene and health evaluation		
Dermal protection	Hand protection	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. For further specification, refer to section 8 of the SDS
	Skin protection	Wear appropriate protective clothing to protect against skin contact.
Respiratory Protection		Wear a respirator providing a minimum efficiency of 95 % For further specification, refer to section 8 of the SDS.
Eye protection		Use tight fitting goggles if dust is generated.

## 2.2 Control of environmental exposure

### 2.2.1 Formulation (ERC 3)

Amounts used	Daily amount per site <5 tonnes/day
	Annual amount per site <25 tonnes/year
Conditions and measures related to sewage treatment plant	Assumed domestic sewage treatment plant flow >2000 m3/day No application of sludge to soil
Conditions and measures related to treatment of waste (including article waste)	Dispose of waste or used sacks/containers according to local regulations. (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.)
Other conditions affecting environmental exposure	Receiving surface water flow > 18000 m3/d
Methods for cleaning	Moisten with water before handling. Spillage should be removed with an aluminium or wooden shovel and placed in a suitable container for later burning. Dispose of in accordance with local regulations for waste handling.
Environmental precautions	Do not allow to enter into sewer, water system or soil.

## Section 3. Exposure and risk estimation

### 3.1 Health

**When the recommended risk management measures (RMMs) and operational conditions (OCs) are adopted, exposures are not expected to exceed the predicted derived no-effect levels (DNELs) and the resulting risk characterization ratio (RCR) are expected to be less than 1.**

Formulation of HMX mixtures in closed batch process (PROC 3)

	Predicted Exposure	RCR	Method	Reference values
Inhalation	0,001 mg/m <sup>3</sup>	< 0,01	TRA Worker	DNEL : 0,28 mg/m <sup>3</sup>
Dermal	0.014 mg/kg bw/day	0,023	TRA Worker	DNEL: 0,6 mg/kg bw/day
All routes		0,027	TRA Worker	

Transfer of HMX mixtures into containers/vessels (PROC 9)

	Predicted Exposure	RCR	Method	Reference values
Inhalation	1E-4 mg/m <sup>3</sup>	< 0.01	TRA Worker	DNEL : 0,28 mg/m <sup>3</sup>
Dermal	0.007 mg/kg bw/day	0.011	TRA Worker	DNEL: 0,6 mg/kg bw/day
All routes		0.012	TRA Worker	

### 3.2 Environment

As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed.

#### 2.3.2.1 Man via the environment

*Exposure of humans via the environment are below the long term systemic derived no-effect levels (DNELs) derived for the general population demonstrating that the manufacture of HMX is safe for human health when exposure (oral and inhalation) is via the environment.*

	Predicted Exposure	RCR	Reference values
<b>Inhalation</b> Local PEC (mg/m <sup>3</sup> )	1.904E-5 mg/m <sup>3</sup>	< 0,01	DNEL: 0,14 mg/m <sup>3</sup>
<b>Oral</b> Exposure via food consumption (mg/kg bw/day)	0.002mg/kg bw/da	0,104	DNEL: 0,02 mg/kg bw/da
<b>Combined routes</b>		0,104	

<b>Section 4: Guidance to check compliance with the exposure scenario</b>
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<b>4.1 Health</b>
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Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
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Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
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<b>4.2 Environment</b>
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Not applicable.
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## Exposure Scenario 4: Production of ammunitions and rocket motors

**Processes, tasks, activities covered:** HMX mixtures or HMX in materials are used in the manufacture of ammunitions and rocket motors.

### Section 1: List of all use descriptors

Sector of use:	
Process category:	<b>PROC9:</b> Transfer of substance or preparation into small containers (dedicated filling line, including weighing) <b>PROC14:</b> Production of preparations or articles by tableting, compression, extrusion, pelletisation
Environmental Release Category:	<b>ERC 5:</b> Industrial use resulting in inclusion into or onto a matrix

### Section 2. Operational Conditions and risk management measures

#### 2.1 Control of workers exposure for PROC9, PROC14

Operational Conditions (OC)	
Physical form of product	White crystalline powder (solid)
Dustiness of material	Covers non or low-dusty materials (e.g. pellets, granules, sugar, salt)
Vapour pressure	0.00000321 Pa at 25 °C
Concentration of substance in product	Covers percentage substance in the product up to 100 %
Frequency and duration of use/exposure	Avoid carrying out activities involving exposure for more than 1 hour
Other Operational Conditions of use affecting workers exposure	
Place of use	Indoor use
Process temperature (for solid)	Covers use at ambient temperatures
<b>General information on risk management related to physicochemical hazard:</b>	HMX is classified as an explosive Div.1.1 H201 under GHS. Workers handling HMX should refer to Section 4-8 of SDS which contains the guidance on safe use of HMX.

#### 2.1.1 Transfer into ammunition cases and rocket motors (PROC9)

Conditions of use	Transfer of HMX mixtures or in materials into ammunition cases and rocket motors using filling lines
Containment	Use in semi-closed process with opportunity for exposure

Risk Management Measures (RMM)	
General	HMX is classified as acutely toxic in contact with skin and harmful if swallowed. Workers working with HMX are required to wear protective equipment and ducting/ventilation system is required at workplace for any operations for which there is a possibility for accidental skin contact and inhalation.
<b>Technical and organisational conditions and measures</b>	Provide a basic standard of general ventilation (1 to 3 air changes per hour). Local exhaust ventilation - efficiency of at least 90 % Advanced (industrial) exposure controls assumed.

#### Conditions and measures related to personal protection, hygiene and health evaluation

Dermal protection	Hand protection	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. For further specification, refer to section 8 of the SDS
	Skin protection	Wear appropriate protective clothing to protect against skin contact.
Respiratory Protection		Wear a respirator providing a minimum efficiency of <b>95 %</b> For further specification, refer to section 8 of the SDS.
Eye protection		Use tight fitting goggles if dust is generated.

#### 2.1.2 Processing of HMX into ammunitions and rocket motors (PROC 14)

Conditions of use	Production of ammunitions and rocket motors by mechanical process or thermal process which can generate fume or dust
Containment	No

Risk Management Measures (RMM)	
General	HMX is classified as acutely toxic in contact with skin and harmful if swallowed. Workers working with HMX are required to wear protective equipment and ducting/ventilation system is required at workplace for any operations for which there is a possibility for accidental skin contact and inhalation.
<b>Technical and organisational conditions and measures</b>	Provide a basic standard of general ventilation (1 to 3 air changes per hour). Local exhaust ventilation - efficiency of at least 90 % Advanced (industrial) exposure controls assumed.

Conditions and measures related to personal protection, hygiene and health evaluation		
Dermal protection	Hand protection	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. For further specification, refer to section 8 of the SDS
	Skin protection	Wear appropriate protective clothing to protect against skin contact.
Respiratory Protection		Wear a respirator providing a minimum efficiency of <b>95 %</b> For further specification, refer to section 8 of the SDS.
Eye protection		Use tight fitting goggles if dust is generated.

## 2.2 Control of environmental exposure

### 2.2.1 Production of ammunitions and rocket motors (ERC 5)

Amounts used	Daily amount per site < 2 tonnes/day
	Annual amount per site < 25 tonnes/year
Conditions and measures related to sewage treatment plant	Estimated substance removal from wastewater via domestic sewage treatment Assumed domestic sewage treatment plant flow >2000 m3/day
Conditions and measures related to treatment of waste (including article waste)	Dispose of waste or used sacks/containers according to local regulations. (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.)
Other conditions affecting environmental exposure	Receiving surface water flow > 18000 m3/d
Methods for cleaning	Moisten with water before handling. Spillage should be removed with an aluminium or wooden shovel and placed in a suitable container for later burning. Dispose of in accordance with local regulations for waste handling.
Environmental precautions	Do not allow to enter into sewer, water system or soil.

## Section 3. Exposure and risk estimation

### 3.1 Health

**When the recommended risk management measures (RMMs) and operational conditions (OCs) are adopted, exposures are not expected to exceed the predicted derived no-effect levels (DNELs) and the resulting risk characterization ratio (RCR) are expected to be less than 1.**

#### Transfer into ammunition cases and rocket motors (PROC9)

	Predicted Exposure	RCR	Method	Reference values
Inhalation	1E-4 mg/m <sup>3</sup>	< 0.01	TRA Worker	DNEL : 0,28 mg/m <sup>3</sup>
Dermal	0.007 mg/kg bw/day	0.011	TRA Worker	DNEL: 0,6 mg/kg bw/day
All routes		0.012	TRA Worker	

#### Processing of HMX into ammunitions and rocket motors (PROC 14)

	Predicted Exposure	RCR	Method	Reference values
Inhalation	1E-4 mg/m <sup>3</sup>	< 0.01	TRA Worker	DNEL : 0,28 mg/m <sup>3</sup>
Dermal	0.003 mg/kg bw/day	< 0.01	TRA Worker	DNEL: 0,6 mg/kg bw/day
All routes		< 0.01	TRA Worker	

### 3.2 Environment

As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed.

#### 2.3.2.1 Man via the environment

*Exposure of humans via the environment are below the long term systemic derived no-effect levels (DNELs) derived for the general population demonstrating that the manufacture of HMX is safe for human health when exposure (oral and inhalation) is via the environment.*

	Predicted Exposure	RCR	Reference values
<b>Inhalation</b> Local PEC (mg/m <sup>3</sup> )	1,904E-6 mg/m <sup>3</sup>	< 0,01	DNEL: 0,14 mg/m <sup>3</sup>
<b>Oral</b> Exposure via food consumption (mg/kg bw/day)	0,016 mg/kg bw/day	0,803	DNEL: 0,02 mg/kg bw/day
<b>Combined routes</b>		0,803	

<b>Section 4: Guidance to check compliance with the exposure scenario</b>
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<b>4.1 Health</b>
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Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
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Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
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<b>4.2 Environment</b>
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Not applicable.
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## Exposure Scenario 5: Production of explosive items (oil and gas exploitation)

### Section 1: List of all use descriptors

Sector of use:	
Process category:	<b>PROC14:</b> Production of preparations or articles by tableting, compression, extrusion, pelletisation
Environmental Release Category:	<b>ERC 5:</b> Industrial use resulting in inclusion into or onto a matrix

### Section 2. Operational Conditions and risk management measures

#### 2.1 Control of workers exposure for PROC14

Operational Conditions (OC)	
Physical form of product	White crystalline powder (solid)
Dustiness of material	Covers non or low-dusty materials (e.g. pellets, granules, sugar, salt)
Vapour pressure	0.00000321 Pa at 25 °C
Concentration of substance in product	Covers percentage substance in the product up to 100 %
Frequency and duration of use/exposure	Avoid carrying out activities involving exposure for more than 1 hour
Other Operational Conditions of use affecting workers exposure	
Place of use	Indoor use
Process temperature (for solid)	Covers use at ambient temperatures
General information on risk management related to physicochemical hazard:	HMX is classified as an explosive Div.1.1 H201 under GHS. Workers handling HMX should refer to Section 4-8 of SDS which contains the guidance on safe use of HMX.

#### 2.1.2 Processing of HMX into explosive products (oil and gas exploitation) (PROC 14)

Conditions of use	Production of explosive products by mechanical process or thermal process which can generate fume or dust.
Containment	No
Risk Management Measures (RMM)	
General	HMX is classified as acutely toxic in contact with skin and harmful if swallowed. Workers working with HMX are required to wear protective equipment and ducting/ventilation system is required at workplace for any operations for which there is a possibility for accidental skin contact and inhalation.
Technical and organisational conditions and measures	Provide a basic standard of general ventilation (1 to 3 air changes per hour). Local exhaust ventilation - efficiency of at least 90 % Advanced (industrial) exposure controls assumed.
Conditions and measures related to personal protection, hygiene and health evaluation	
Dermal protection	Hand protection
	Skin protection
Respiratory Protection	Wear a respirator providing a minimum efficiency of <b>95 %</b> For further specification, refer to section 8 of the SDS.
Eye protection	Use tight fitting goggles if dust is generated.

#### 2.2 Control of environmental exposure

##### 2.2.1 Production of explosive items (oil and gas exploitation) (ERC 5)

Amounts used	Daily amount per site < 2 tonnes/day Annual amount per site < 25 tonnes/year
Conditions and measures related to sewage treatment plant	Estimated substance removal from wastewater via domestic sewage treatment Assumed domestic sewage treatment plant flow >2000 m3/day
Conditions and measures related to treatment of waste (including article waste)	Dispose of waste or used sacks/containers according to local regulations. (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.)
Other conditions affecting environmental exposure	Receiving surface water flow > 18000 m3/d
Methods for cleaning	Moisten with water before handling. Spillage should be removed with an aluminium or wooden shovel and placed in a suitable container for later burning. Dispose of in accordance with local regulations for waste handling.
Environmental precautions	Do not allow to enter into sewer, water system or soil.



### Section 3. Exposure and risk estimation

#### 3.1 Health

*When the recommended risk management measures (RMMs) and operational conditions (OCs) are adopted, exposures are not expected to exceed the predicted derived no-effect levels (DNELs) and the resulting risk characterization ratio (RCR) are expected to be less than 1.*

Processing of HMX into explosive products (oil and gas exploitation) (PROC 14)

	Predicted Exposure	RCR	Method	Reference values
Inhalation	1E-4 mg/m <sup>3</sup>	< 0.01	TRA Worker	DNEL : 0,28 mg/m <sup>3</sup>
Dermal	0.003 mg/kg bw/day	< 0.01	TRA Worker	DNEL: 0,6 mg/kg bw/day
All routes		< 0.01	TRA Worker	

#### 3.2 Environment

As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed.

##### 2.3.2.1 Man via the environment

*Exposure of humans via the environment are below the long term systemic derived no-effect levels (DNELs) derived for the general population demonstrating that the manufacture of HMX is safe for human health when exposure (oral and inhalation) is via the environment.*

	Predicted Exposure	RCR	Reference values
<b>Inhalation</b> Local PEC (mg/m <sup>3</sup> )	1,904E-6 mg/m <sup>3</sup>	< 0,01	DNEL: 0,14 mg/m <sup>3</sup>
<b>Oral</b> Exposure via food consumption (mg/kg bw/day)	0,016 mg/kg bw/day	0,803	DNEL: 0,02 mg/kg bw/day
<b>Combined routes</b>		0,803	

### Section 4: Guidance to check compliance with the exposure scenario

#### 4.1 Health

Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.

#### 4.2 Environment

Not applicable.

## Exposure Scenario 6: Scientific research and development and related laboratory activities

### Section 1: List of all use descriptors

Sector of use:	SU24: Scientific research and development
Process category:	PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC14: Production of preparations or articles by tableting, compression, extrusion, pelletisation
Environmental Release Category:	ERC 5: Industrial use resulting in inclusion into or onto a matrix

### Section 2. Operational Conditions and risk management measures

#### 2.1 Control of workers exposure for PROC9, PROC14

Operational Conditions (OC)	
Physical form of product	White crystalline powder (solid)
Dustiness of material	Covers non or low-dusty materials (e.g. pellets, granules, sugar, salt)
Vapour pressure	0.00000321 Pa at 25 °C
Concentration of substance in product	Covers percentage substance in the product up to 100 %
Frequency and duration of use/exposure	Avoid carrying out activities involving exposure for more than 1 hour
Other Operational Conditions of use affecting workers exposure	
Place of use	Indoor use
Process temperature (for solid)	Covers use at ambient temperatures
General information on risk management related to physicochemical hazard:	HMX is classified as an explosive Div.1.1 H201 under GHS. Workers handling HMX should refer to Section 4-8 of SDS which contains the guidance on safe use of HMX.

#### 2.1.1 Transfer of HMX or preparation into small containers (PROC9)

Conditions of use	Scientific research and development laboratory activities
Containment	Use in semi-closed process with opportunity for exposure
Risk Management Measures (RMM)	
General	HMX is classified as acutely toxic in contact with skin and harmful if swallowed. Workers working with HMX are required to wear protective equipment and ducting/ventilation system is required at workplace for any operations for which there is a possibility for accidental skin contact and inhalation.
Technical and organisational conditions and measures	Provide a basic standard of general ventilation (1 to 3 air changes per hour). Local exhaust ventilation - efficiency of at least 90 % Advanced (industrial) exposure controls assumed.
Conditions and measures related to personal protection, hygiene and health evaluation	
Dermal protection	Hand protection
	Skin protection
Respiratory Protection	Wear a respirator providing a minimum efficiency of 95 % For further specification, refer to section 8 of the SDS.
Eye protection	Use tight fitting goggles if dust is generated.

#### 2.1.2 Processing of HMX in Research and development activities (PROC 14)

Conditions of use	Scientific research and development laboratory activities
Containment	No
Risk Management Measures (RMM)	
General	HMX is classified as acutely toxic in contact with skin and harmful if swallowed. Workers working with HMX are required to wear protective equipment and ducting/ventilation system is required at workplace for any operations for which there is a possibility for accidental skin contact and inhalation.
Technical and organisational conditions and measures	Provide a basic standard of general ventilation (1 to 3 air changes per hour). Local exhaust ventilation - efficiency of at least 90 % Advanced (industrial) exposure controls assumed.
Conditions and measures related to personal protection, hygiene and health evaluation	
Dermal protection	Hand protection
	Skin protection

Respiratory Protection	Wear a respirator providing a minimum efficiency of 95 % For further specification, refer to section 8 of the SDS.
Eye protection	Use tight fitting goggles if dust is generated.

## 2.2 Control of environmental exposure

### 2.2.1 Scientific research and development (ERC 5)

Amounts used	Daily amount per site < 0,0005 tonnes/day Annual amount per site < 0,01 tonnes/year
Conditions and measures related to sewage treatment plant	Estimated substance removal from wastewater via domestic sewage treatment Assumed domestic sewage treatment plant flow >2000 m3/day
Conditions and measures related to treatment of waste (including article waste)	Dispose of waste or used sacks/containers according to local regulations. (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.)
Other conditions affecting environmental exposure	Receiving surface water flow > 18000 m3/d
Methods for cleaning	Moisten with water before handling. Spillage should be removed with an aluminium or wooden shovel and placed in a suitable container for later burning. Dispose of in accordance with local regulations for waste handling.
Environmental precautions	Do not allow to enter into sewer, water system or soil.

## Section 3. Exposure and risk estimation

### 3.1 Health

*When the recommended risk management measures (RMMs) and operational conditions (OCs) are adopted, exposures are not expected to exceed the predicted derived no-effect levels (DNELs) and the resulting risk characterization ratio (RCR) are expected to be less than 1.*

Transfer of HMX or preparation into small containers (PROC9)

	Predicted Exposure	RCR	Method	Reference values
Inhalation	1E-4 mg/m <sup>3</sup>	< 0.01	TRA Worker	DNEL : 0,28 mg/m <sup>3</sup>
Dermal	0.007 mg/kg bw/day	0.011	TRA Worker	DNEL: 0,6 mg/kg bw/day
All routes		0.012	TRA Worker	

Processing of HMX in Research and development activities (PROC 14)

	Predicted Exposure	RCR	Method	Reference values
Inhalation	1E-4 mg/m <sup>3</sup>	< 0.01	TRA Worker	DNEL : 0,28 mg/m <sup>3</sup>
Dermal	0.003 mg/kg bw/day	< 0.01	TRA Worker	DNEL: 0,6 mg/kg bw/day
All routes		< 0.01	TRA Worker	

### 3.2 Environment

As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed.

#### 2.3.2.1 Man via the environment

*Exposure of humans via the environment are below the long term systemic derived no-effect levels (DNELs) derived for the general population demonstrating that the manufacture of HMX is safe for human health when exposure (oral and inhalation) is via the environment.*

	Predicted Exposure	RCR	Reference values
<b>Inhalation</b> Local PEC (mg/m <sup>3</sup> )	3,808E-6 mg/m <sup>3</sup>	< 0,01	DNEL: 0,14 mg/m <sup>3</sup>
<b>Oral</b> Exposure via food consumption (mg/kg bw/day)	5,732E-4 mg/kg bw/day	0,029	DNEL: 0,02 mg/kg bw/day
<b>Combined routes</b>		0,029	

## Section 4: Guidance to check compliance with the exposure scenario

### 4.1 Health

Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.

### 4.2 Environment

Not applicable.

## Exposure Scenario 7: Production of shock tube

### Section 1: List of all use descriptors

Sector of use:	
Process category:	<b>PROC5:</b> Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
Environmental Release Category:	<b>ERC5:</b> Industrial use resulting in inclusion into or onto a matrix

### Section 2. Operational Conditions and risk management measures

#### 2.1 Control of workers exposure for PROC5

Operational Conditions (OC)	
Physical form of product	White crystalline powder (solid)
Dustiness of material	Covers non or low-dusty materials (e.g. pellets, granules, sugar, salt)
Vapour pressure	0.00000321 Pa at 25 °C
Concentration of substance in product	Covers percentage substance in the product up to 100 %
Frequency and duration of use/exposure	Avoid carrying out activities involving exposure for more than 1 hour
Other Operational Conditions of use affecting workers exposure	
Place of use	Indoor use
Process temperature (for solid)	Covers use at ambient temperatures
<b>General information on risk management related to physicochemical hazard:</b>	HMX is classified as an explosive Div.1.1 H201 under GHS. Workers handling HMX should refer to Section 4-8 of SDS which contains the guidance on safe use of HMX.

#### 2.1.1 Production of shock tube (PROC5)

Conditions of use	HMX is Mixed with other substance(s) and finely coated onto internal wall of small diameter plastic tube, in shock tube application and surline signal transmission tubing
Containment	Use in semi-closed process with opportunity for exposure

Risk Management Measures (RMM)	
General	HMX is classified as acutely toxic in contact with skin and harmful if swallowed. Workers working with HMX are required to wear protective equipment and ducting/ventilation system is required at workplace for any operations for which there is a possibility for accidental skin contact and inhalation.
<b>Technical and organisational conditions and measures</b>	Provide a basic standard of general ventilation (1 to 3 air changes per hour). Local exhaust ventilation - efficiency of at least 90 % Advanced (industrial) exposure controls assumed.

#### Conditions and measures related to personal protection, hygiene and health evaluation

Dermal protection	Hand protection	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. For further specification, refer to section 8 of the SDS
	Skin protection	Wear appropriate protective clothing to protect against skin contact.
Respiratory Protection		Wear a respirator providing a minimum efficiency of 95 % For further specification, refer to section 8 of the SDS.
Eye protection		Use tight fitting goggles if dust is generated.

#### 2.2 Control of environmental exposure

##### 2.2.1 Production of shock tube (ERC 5)

Amounts used	Daily amount per site < 2 tonnes/day
	Annual amount per site < 25 tonnes/year
<b>Conditions and measures related to sewage treatment plant</b>	Estimated substance removal from wastewater via domestic sewage treatment Assumed domestic sewage treatment plant flow >2000 m3/day
<b>Conditions and measures related to treatment of waste (including article waste)</b>	Dispose of waste or used sacks/containers according to local regulations. (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.)
<b>Other conditions affecting environmental exposure</b>	Receiving surface water flow > 18000 m3/d
Methods for cleaning	Moisten with water before handling. Spillage should be removed with an aluminium or wooden shovel and placed in a suitable container for later burning. Dispose of in accordance with local regulations for waste handling.
Environmental precautions	Do not allow to enter into sewer, water system or soil.

### Section 3. Exposure and risk estimation

#### 3.1 Health

*When the recommended risk management measures (RMMs) and operational conditions (OCs) are adopted, exposures are not expected to exceed the predicted derived no-effect levels (DNELs) and the resulting risk characterization ratio (RCR) are expected to be less than 1.*

Production of shock tube (PROC5)

	Predicted Exposure	RCR	Method	Reference values
Inhalation	5E-4 mg/m <sup>3</sup>	< 0.01	TRA Worker	DNEL : 0,28 mg/m <sup>3</sup>
Dermal	0.014 mg/kg bw/day	0.023	TRA Worker	DNEL: 0,6 mg/kg bw/day
All routes		0.025	TRA Worker	

#### 3.2 Environment

As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed.

##### 2.3.2.1 Man via the environment

*Exposure of humans via the environment are below the long term systemic derived no-effect levels (DNELs) derived for the general population demonstrating that the manufacture of HMX is safe for human health when exposure (oral and inhalation) is via the environment.*

	Predicted Exposure	RCR	Reference values
<b>Inhalation</b> Local PEC (mg/m <sup>3</sup> )	1,904E-6 mg/m <sup>3</sup>	< 0,01	DNEL: 0,14 mg/m <sup>3</sup>
<b>Oral</b> Exposure via food consumption (mg/kg bw/day)	0,016 mg/kg bw/day	0,803	DNEL: 0,02 mg/kg bw/day
<b>Combined routes</b>		0,803	

### Section 4: Guidance to check compliance with the exposure scenario

#### 4.1 Health

Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.

#### 4.2 Environment

Not applicable.

## Exposure Scenario 8: Use of ammunition (military use)

### Section 1: List of all use descriptors

Sector of use:	Professional
Process category:	PROC1: Use in closed process, no likelihood of exposure
Environmental Release Category:	Use of ammunition (military use)

### Section 2. Operational Conditions and risk management measures

#### 2.1 Control of workers exposure for PROC1

Operational Conditions (OC)	
Physical form of product	White crystalline powder (solid)
Dustiness of material	Covers non or low-dusty materials (e.g. pellets, granules, sugar, salt)
Vapour pressure	0.00000321 Pa at 25 °C
Concentration of substance in product	Covers percentage substance in the product up to 100 %
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours
Other Operational Conditions of use affecting workers exposure	
Place of use	Ensure operation is undertaken outdoors
Process temperature (for solid)	Covers use at ambient temperatures
General information on risk management related to physicochemical hazard:	HMX is classified as an explosive Div.1.1 H201 under GHS.

#### 2.1.1 Military firing of ammunitions (PROC1)

Conditions of use	Firing of ammunition by the military. HMX decomposes fully therefore the professional has no contact with HMX
Containment	Use in closed process, no likelihood of exposure
Risk Management Measures (RMM)	
Technical and organisational conditions and measures	Basic (professional) exposure controls assumed.

#### 2.2 Control of environmental exposure

##### 2.2.1 Use of ammunition (military use)

Conditions and measures related to sewage treatment plant	Estimated substance removal from wastewater via domestic sewage treatment Assumed domestic sewage treatment plant flow >2000 m3/day
Conditions and measures related to treatment of waste (including article waste)	Dispose of waste or used sacks/containers according to local regulations. (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.)
Other conditions affecting environmental exposure	Receiving surface water flow > 18000 m3/d
Environmental precautions	Do not allow to enter into sewer, water system or soil.

### Section 3. Exposure and risk estimation

#### 3.1 Health

*When the recommended risk management measures (RMMs) and operational conditions (OCs) are adopted, exposures are not expected to exceed the predicted derived no-effect levels (DNELs) and the resulting risk characterization ratio (RCR) are expected to be less than 1.*

Transfer of HMX or preparation into small containers (PROC9)

	Predicted Exposure	RCR	Method	Reference values
Inhalation	0,007 mg/m <sup>3</sup>	0,025	TRA Worker	DNEL : 0,28 mg/m <sup>3</sup>
Dermal	0.034 mg/kg bw/day	0,057	TRA Worker	DNEL: 0,6 mg/kg bw/day
All routes		0,082	TRA Worker	

#### 3.2 Environment

As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed.

<b>Section 4: Guidance to check compliance with the exposure scenario</b>
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<b>4.1 Health</b>
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Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
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Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
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<b>4.2 Environment</b>
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Not applicable.
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## Exposure Scenario 9: Rock-blasting, gas- and oil industry, military personnel, metalworking, shock tube use, mining, demolition and site preparation

### Section 1: List of all use descriptors

Sector of use:	Professional SU 0: Other SU 2a: Mining, (without offshore industries) SU 2b: Offshore industries SU 15: Manufacture of fabricated metal products, except machinery and equipment
Process category:	PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC 14: Production of preparations or articles by tableting, compression, extrusion, pelletisation PROC 24: High (mechanical) energy work-up of substances bound in materials and/or articles
Environmental Release Category:	Rock-blasting, gas- and oil industry, military personnel, metalworking, shock tube use, mining, demolition and site preparation

### Section 2. Operational Conditions and risk management measures

#### 2.1 Control of workers exposure for PROC2, PROC9, PROC14

Operational Conditions (OC)	
Physical form of product	White crystalline powder (solid)
Dustiness of material	Covers non or low-dusty materials (e.g. pellets, granules, sugar, salt)
Vapour pressure	0.00000321 Pa at 25 °C
Concentration of substance in product	Covers percentage substance in the product up to 100 %
Frequency and duration of use/exposure	Avoid carrying out activities involving exposure for more than 1 hour
Other Operational Conditions of use affecting workers exposure	
Place of use	Ensure operation is undertaken outdoors
Process temperature (for solid)	Covers use at ambient temperatures
General information on risk management related to physicochemical hazard:	HMX is classified as an explosive Div.1.1 H201 under GHS.

#### 2.1.1 Use in closed, continuous process with occasional controlled exposure (PROC2)

Conditions of use		Rock-blasting, gas- and oil industry
Containment		Use in closed, continuous process with occasional controlled exposure
Risk Management Measures (RMM)		
Technical and organisational conditions and measures		Basic (professional) exposure controls assumed.
Conditions and measures related to personal protection, hygiene and health evaluation		
Dermal protection	Hand protection	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. For further specification, refer to section 8 of the SDS
	Skin protection	Wear appropriate protective clothing to protect against skin contact.
Respiratory Protection		No
Eye protection		Wear approved safety goggles.

#### 2.1.2 Transfer of substance or preparation into small containers (dedicated filling line, including weighing) (PROC9)

Containment		Use in semi-closed process with opportunity for exposure
Risk Management Measures (RMM)		
Technical and organisational conditions and measures		Basic (professional) exposure controls assumed.
Conditions and measures related to personal protection, hygiene and health evaluation		
Dermal protection	Hand protection	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. For further specification, refer to section 8 of the SDS
	Skin protection	Wear appropriate protective clothing to protect against skin contact.
Respiratory Protection		Wear a respirator providing a minimum efficiency of <b>95 %</b> For further specification, refer to section 8 of the SDS.
Eye protection		Use tight fitting goggles if dust is generated.



2.1.3 Production of preparations or articles by tableting, compression, extrusion, pelletisation (PROC14)		
Containment		No
Risk Management Measures (RMM)		
Technical and organisational conditions and measures		Basic (professional) exposure controls assumed.
Conditions and measures related to personal protection, hygiene and health evaluation		
Dermal protection	Hand protection	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. For further specification, refer to section 8 of the SDS
	Skin protection	Wear appropriate protective clothing to protect against skin contact.
Respiratory Protection		Wear a respirator providing a minimum efficiency of <b>95 %</b> For further specification, refer to section 8 of the SDS.
Eye protection		Use tight fitting goggles if dust is generated.

2.1.4 High (mechanical) energy work-up of substances bound in materials and/or articles (PROC24)		
Operational Conditions (OC)		
Physical form of product		White crystalline powder (solid)
Solid in solid mixtures		Covers solid products only
Vapour pressure		0.00000321 Pa at 25 °C
Concentration of substance in mixture		Covers percentage substance in the product up to 100 %
Frequency and duration of use/exposure		Avoid carrying out activities involving exposure for more than 1 hour
Other Operational Conditions of use affecting workers exposure		
Place of use		Ensure operation is undertaken outdoors
Process temperature (for solid)		Elevated temperature > melting point
General information on risk management related to physicochemical hazard:		HMX is classified as an explosive Div.1.1 H201 under GHS.
Containment		No
Risk Management Measures (RMM)		
Technical and organisational conditions and measures		Basic (professional) exposure controls assumed.
Conditions and measures related to personal protection, hygiene and health evaluation		
Dermal protection	Hand protection	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training. For further specification, refer to section 8 of the SDS
	Skin protection	Wear appropriate protective clothing to protect against skin contact.
Respiratory Protection		Wear a respirator providing a minimum efficiency of <b>95 %</b> For further specification, refer to section 8 of the SDS.
Eye protection		Use tight fitting goggles if dust is generated.

2.2 Control of environmental exposure	
2.2.1 Rock-blasting, gas- and oil industry, military personnel, metalworking, shock tube use, mining, demolition and site preparation	
Conditions and measures related to sewage treatment plant	Estimated substance removal from wastewater via domestic sewage treatment Assumed domestic sewage treatment plant flow >2000 m3/day
Conditions and measures related to treatment of waste (including article waste)	Dispose of waste or used sacks/containers according to local regulations. (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.)
Other conditions affecting environmental exposure	Receiving surface water flow > 18000 m3/d
Environmental precautions	Do not allow to enter into sewer, water system or soil.

Section 3. Exposure and risk estimation				
3.1 Health				
<i>When the recommended risk management measures (RMMs) and operational conditions (OCs) are adopted, exposures are not expected to exceed the predicted derived no-effect levels (DNELs) and the resulting risk characterization ratio (RCR) are expected to be less than 1.</i>				
Use in closed, continuous process with occasional controlled exposure (PROC2)				
	Predicted Exposure	RCR	Method	Referance values
Inhalation	0,001 mg/m <sup>3</sup>	< 0,01	TRA Worker	DNEL : 0,28 mg/m <sup>3</sup>
Dermal	0.027 mg/kg bw/day	0,046	TRA Worker	DNEL: 0,6 mg/kg bw/day
All routes		0,051	TRA Worker	

Transfer of substance or preparation into small containers (dedicated filling line, including weighing) (PROC9)

	Predicted Exposure	RCR	Method	Reference values
Inhalation	0,003 mg/m <sup>3</sup>	0,012	TRA Worker	DNEL : 0,28 mg/m <sup>3</sup>
Dermal	0.137 mg/kg bw/day	0,229	TRA Worker	DNEL: 0,6 mg/kg bw/day
All routes		0,241	TRA Worker	

Production of preparations or articles by tableting, compression, extrusion, pelletisation (PROC14)

	Predicted Exposure	RCR	Method	Reference values
Inhalation	0,007 mg/m <sup>3</sup>	0,025	TRA Worker	DNEL : 0,28 mg/m <sup>3</sup>
Dermal	0.069 mg/kg bw/day	0,114	TRA Worker	DNEL: 0,6 mg/kg bw/day
All routes		0,139	TRA Worker	

High (mechanical) energy work-up of substances bound in materials and/or articles (PROC24)

	Predicted Exposure	RCR	Method	Reference values
Inhalation	0,14 mg/m <sup>3</sup>	0,5	TRA Worker	DNEL : 0,28 mg/m <sup>3</sup>
Dermal	0.283 mg/kg bw/day	0,472	TRA Worker	DNEL: 0,6 mg/kg bw/day
All routes		0,972	TRA Worker	

### 3.2 Environment

As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed.

## Section 4: Guidance to check compliance with the exposure scenario

### 4.1 Health

Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.

### 4.2 Environment

Not applicable.